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Proc Dev Prog

12 August 1965

Please Reference:
A51-65-3326

U. S. Government

Subject: [redacted] 675-65WR - Our Sales Order 1-10290-1 STAT

Gentlemen:

We are pleased to provide the first in a series of Monthly Progress Reports covering the effort expended on subject contract during the period of July 5, 1965 to August 1, 1965.

Program

During this first month, in addition to continuing certain investigations begun under the previous contract which are described later in this report, we have had several discussions with your technical staff concerning the content and direction of the current program.

The result of these discussions has been the elimination of the beginning of the Contamination Study Program and the Viscous Processing Study in order to obtain maximum emphasis on the study of heat shock techniques. We are also instituting a study of Film Drying Techniques which promises to be of significant and immediate practical worth.

Attached are single page synopses of the research tasks of the program as it is now constituted.

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Research Program

1. Air Bearing (Tunnel)

Experimental evaluation of the Tunnel-Type Air Intertank Transfer Bearing is essentially complete. It was powered by a single lamb, pressure/vacuum, blower, Model IS 11520 (the same unit as will be used on the Positive Pressure Transport Capstain tests), a number of efficiency/capacity tests were performed prior to the bearing tests. These were compared directly with the manufacturer's rating curves and suitable graphs were prepared.

To facilitate testing, a large, calibrated, Roots-Connersville meter was borrowed at no charge from the Southern Counties Gas Company. This instrument was capable of reading a total flow of 23,000 cfh with an accuracy of - 1.6 percent. All readings were corrected and the blower output measured. The blower proved to be about 10.6 percent more efficient at the same rpm when used as a vacuum pump than it did as a blower.

The tunnel bearing consists essentially of three concentric U-shaped sections of sufficient length to handle 9-1/2-inch wide film. The two inner sections are perforated with a pattern of holes through which opposing jets of air can be injected. The film path is between the center of these jet streams and surplus air is bled off through a series of side vents. Previous tests showed the film supporting characteristics to be somewhat erratic and high-frequency vibration was introduced. One of the main objectives of this phase of the program, then, was to improve the prototype design and operating capabilities.

Toward this end, sump-type air traps were added to the inlet and outlet sides of the bearing and the unit retested with medium-base film while suspended over a tank of water. Some difficulty was experienced from the fact that the emulsion side of the wet film is quite gelatinous and tended to cohere to the methacrylate surfaces of the bearing, thus causing uneven behavior. This condition would not occur in actual practice since developer and water do not have an analogous effect on the film and methacrylate would probably not be the material of construction. In this case, however, internal visibility was of paramount importance. This test will be repeated with leader substituted.

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By partially disassembling the model, it proved possible to measure the static pressure at each of the several hundred jet openings. These were then redrilled to balance the pressures closely. It is anticipated that performance can be further improved by fairing the pressure side of each of the jet orifices. These two tests are all that remain before compilation of the final report on this phase of the program.

2. Rotatron Liquid Bearing

The experimental evaluation of the rotary fluid bearing characteristics was continued with modifications based on three different stator cage configurations and changes to the squirrel-cage axial vane impellors. The first cage tested was constructed of a methyl methacrylate tube 4.47-inches O.D. and 4.23-inches I.D. It was machined with 24 slots, or gills, each 0.030 inches wide and approximately tangential to the inside diameter of the tube. Every other slot was discontinued in the center portion to leave a 1.6-inch island. The intervening slots were the full ten-inch length (slightly shorter at the inside due to the 2-1/2-inch radius of the milling cutter).

This configuration provided a stable cushion for 5- and 9-1/2-inch films at speeds of 157 and 230 rpm. However, the cushion was slightly eccentric being wider at the 9 o'clock position (with rotation clockwise) and sucking in at the 4 o'clock position. Bottom flow was eliminated by taping the slots and adding a strip of coving to the trailing edge of the cage and a strip of tape to the leading edge. Repeat runs showed excellent cushion stability and good centering for the 5- and 6.6-inch loops, but a tendency to drift when 9-1/2-inch film was tested. Restricting the slots at the center by a band and increasing the revolutions to 350 still did not improve tracking of 9-1/2-inch film loop. The performance, however, was still superior to the original helical cage.

A second series of similar tests was run using a polyvinyl chloride tube 4.5-inches O.D. and 4.05-inches I.D. The center island of alternate slots were 1.73 inches long. This P.V.C. tube allowed almost no clearance between the impellor blades and the interior of the housing cage and some rotational difficulty was experienced because of a slight eccentricity in the impellor diameter. The

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results closely duplicated the methacrylate cage and, again, only the 9-1/2-inch film required edge restraint to assure tracking.

The final tests were modifications of the series commenced during the last contractual period. For these, the thin aluminum perforated screen was used. There are 225 holes per square inch, each .041-inches in diameter which provides an open area of 29.7 percent. By making various changes to the outside of the cage and to the impellor blades themselves (to offset the center pressure effect), a combination was found which permitted 70 mm, 5- and 6.6-inch film loops to center well without format or speed changes. All three would immediately return to center after being moved to either side. A shallow edge flange was still necessary to prevent the 9-1/2-inch film from derailing. It is felt that a change in impellor design could correct this requirement. Record photographs were taken of these experiments.

3. Sensitometric Studies

The sensitometric studies now being conducted are designed to provide the photographic technician with a family of gamma curves. From these curves the technician may select any gamma that will best suit the subject matter being processed over a wide range of time-temperature combinations with the resultant effects upon resolution, chemical fog, speed and granularity. These studies are an extension of those conducted under the previous contract in which the same emulsions were developed to produce a constant gamma throughout the various time/temperature combinations used.

During the current report period samples of 4401 were prepared and processed at the 5 minute, 68°F level. These test samples produced an increase in gamma from the control sample, which was a gamma of 2.24 for 8 minutes at 68°F. Thus indicates that the 5 minute at 68oF test reached gamma infinity. In order to prove these results a time/gamma curve was developed. The study will continue at a developing temperature of 78°F, and a family of gamma curves prepared.

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Funds expended during the reporting period are approximately [redacted] STAT

If you should have any questions or desire further information, please do not hesitate to contact us.

Very truly yours,

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